U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Chamaecrista lineata* (Sw.) Greene var. *keyensis* (Pennell) H.S. Irwin & Barneby (= *Cassia keyensis* (Pennell) Macbride)

COMMON NAME: Big Pine partridge pea (= Narrowpod sensitive pea, Key cassia)

LEAD REGION: 4

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION:

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

___ New candidate

_X Continuing candidate

___ Non-petitioned

_X Petitioned - Date petition received: May 11, 2004

__ 90-day positive - FR date:

__ 12-month warranted but precluded - FR date:

__ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).

___ Listing priority change

Former LP: ___

New LP: ___

Date when the species first became a Candidate (as currently defined): October 25, 1999

___ Candidate removal: Former LP: ___

___ A - Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F - Range is no longer a U.S. territory.

___ I - Insufficient information exists on biological vulnerability and threats to support listing.

___ M - Taxon mistakenly included in past notice of review.

___ N - Taxon may not meet the Act's definition of "species."

___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Fabaceae, Pea Family

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, U.S.A.

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, Monroe County, U.S.A.

LAND OWNERSHIP: Ross and Ruiz (1996) estimated that about 90% of the plants are on National Key Deer Refuge. Some are on The Nature Conservancy's (TNC) 8 ha (20 acre) Terrestris Preserve, and others on land belonging to numerous private owners. Apart from road right-of-ways, we are not aware of State or local government ownership. However, given its widespread distribution on Big Pine Key, it is likely that the species occurs on some parcels owned by the State and Monroe County.

LEAD REGION CONTACT: Richard Gooch, 404-679-7124

LEAD FIELD OFFICE CONTACT: South Florida Ecological Services Office, Phillip Hughes, 305-872-2753

BIOLOGICAL INFORMATION:

Species Description: A small prostrate to ascending herbaceous shrub with yellow flowers and feathery pinnately-compound leaves. "Young branches are pilosulous; stipules 3-9.5 x 0.7-2 mm.; leaves 1.7-3.5 (-4) cm; gland 0.3-0.6 mm diameter, sessile or nearly so; leaflets (5-) 6-9 pairs, oblong-lanceolate, obtuse mucronulate, 7-12 x 2-4.5 (-5) mm; sepals 9-20 mm long; petals 11-15 mm long; ovules 10-13; pod 33-45 x 4.5 – 5 mm, pilosulous." (Bradley and Gann 1999, adapted from Irwin and Barneby 1982).

Taxonomy: This subfamily is mostly tropical, including nickers (*Caesalpinia*). The genus *Chamaecrista* includes several common annual plants of the southeastern U.S., especially *Chamaecrista fasciculata*, the partridge pea, which occurs throughout Florida, except for the Keys. The authoritative taxonomic treatment of *Chamaecrista* and its relatives is by Irwin and Barneby (1982). *Chamaecrista lineata* is "almost ubiquitous" in the Bahama Archipelago, including the Turks and Caicos, and is present in Cuba and Hispaniola (Correll and Correll 1982). *Chamaecrista lineata* var. *brachyloba* is present in Puerto Rico and the Virgin Islands (U.S. Department of Agriculture, Natural Resources Conservation Service 2004).

"John Loomis Blodgett was the first to collect this taxon sometime between 1838 and 1852 on "Pine Key" (Big Pine Key). Pollard (1894) was the first to recognize that this was different than other Florida species of *Chamaecrista*, calling it *C. grammica*, a West Indian plant now called *C. lineata* var. *brachyloba* (Irwin and Barneby 1982). Small (1903, 1913) followed this usage. In 1917 Pennell recognized it as a distinct endemic species, naming it *Chamaecrista keyensis* (see Irwin and Barneby 1982). This name was also retained by Small (1933). In 1919, Macbride placed the taxon in the genus Cassia, creating the name *Cassia keyensis* (see Isley 1975). Isley (1975) and Long and Lakela (1971) followed this treatment. In an exhaustive study of *Cassia* and *Chamaecrista* in 1982, Irwin and Barneby noticed the similarity between plants in Florida and other parts of the West Indies. Retaining the [Keys] plant in the genus *Chamaecrista*, they named the plant *C. lineata* var. *keyensis*, retaining it as endemic with close relatives in the Bahamas and Cuba. Isely (1990) and Wunderlin (1988) have followed this treatment. Synonyms: *Cassia keyensis* (Pennell) J.F. Macbr.; *Chamaecrista keyensis* Pennell; *Chamaecrista grammica* Spreng., misapplied; *Cassia grammica* Spreng., misapplied." (Bradley and Gann 1999).

Habitat: Big Pine partridge pea occurs only in pine rocklands vegetation (south Florida slash pine with tropical understory, on limestone rock) and on the edges of rockland hammocks (tropical hardwood forests). Pine rocklands in the lower Florida Keys are dominated by a canopy of southern slash pine (*Pinus elliottii* var. *densa*). The subcanopy is composed of several palms such as Key thatch palm (*Thrinax morrisii*), Florida thatch palm (*Thrinax radiata*), and silver palm (*Coccothrinax argentata*), and several hardwoods such as locustberry (*Byrsonima lucida*) and longstalked stopper (*Psidium longipes* [*Mosiera longipes*]) (Ross and Ruiz 1996). *C. lineata* var. *keyensis* is often associated with *Centrosema virginianum, Galactia parvifolia, Linum arencola, Melanthera parvifolia, Polygala grandiflora, Thrinax morrissii* and *Tragia saxicola* (Muir and Liu 2003). Ross and Ruiz (1996) found that it occurs primarily in areas where hardwoods are relatively unimportant, and where understory and overstory palms are important. *C. lineata* var. *keyensis* is most likely to be found in canopy openings, and requires full to partial shade. It is capable of colonizing disturbed areas within pine rockland habitat, such as dirt roads. It does not persist in damp soil or depressions (Muir and Liu 2003).

Pine rockland is maintained by relatively frequent fires, which maintain the understory woody plants at shrub height. In the absence of fire, many areas become wooded, forming tropical rockland hammock. Wunderlin and Hansen (2000) comment that rockland hammock plants are rooted in a thin layer of organic soil overlying the rock, or pocketed in solution holes. This

organic material burns readily when dry, so that by limiting accumulations of organic matter, fires have limited the extent of hammocks. As with other pineland plants, Big Pine partridge pea is shade intolerant, and requires periodic burning to reduce competition from woody vegetation (TNC 1999).

Fire is an important element in maintaining the pine rockland habitat. Periodic fires eliminate the shrub subcanopy and remove litter from the ground (Bradley and Gann 1999). "The pine rocklands of the lower Florida Keys have evolved and adapted to frequent fires (Snyder et al. 1990). In the absence of fire these areas mature into hardwood forests with a few pines in the canopy (Snyder et al. 1990). Alexander and Dickson (1972) suggested that this process may take up to 50 years in the Florida Keys. A fundamental question about fire ecology in pine rocklands is how frequently they should burn and during what season. Snyder et al. (1990) inferred the historic fire regimes on the Florida mainland by looking at the time it takes for the herbaceous layer to be excluded from an area by shading (maximum time between fire) and the point where enough fuel is available to carry a fire (minimum time since fires). The minimum fire regime they found was two to three years and the maximum was 15 years. This wide range in fire frequencies would result in different forest structures and dynamics. This would lead us to believe that a mosaic of burns should be used in the management of pine rocklands." (Bradley and Gann 1999).

Presently, the recommended burn regime in Miami-Dade County pine rocklands is three to seven years with summer fires generally preferred to winter. It is likely that this is too short a fire frequency in the Florida Keys where soil and water conditions limit plant growth. Summer fires are preferred since most lightning strikes (the historical cause of fires) occur in the wet, summer months. In areas where fires have been suppressed for many years, the reintroduction of fire may have to be done in a step-wise fashion. In some areas it may include winter burns, or removal of some fuel to prevent a hot fire. Ross and Ruiz (1996) found little relation between long term fire frequency and densities of populations. Overall, they found they found the plant essentially throughout their study area.

Historical Range/Distribution: Long and Lakela (1971) reported that the species was historically known from Big Pine Key and from one site on Cudjoe Key. Bradley and Gann (1999) summarized the distribution as follows: "*C. lineata* var. *keyensis* was historically known from Big Pine Key, No Name Key, Ramrod Key, and Cudjoe Key, all in the lower Florida Keys, Monroe County (Muir and Liu 2003). It has apparently been extirpated from all but Big Pine Key (Ross and Ruiz 1997; Gann et al. 2002). This plant has not been reported for other islands in some time (Cudjoe Key in 1977 [Weiner 1979], Ramrod Key in 1911, and No Name Key in 1895). Plants may persist on those islands, most likely Cudjoe Key, but more thorough searches are needed. Ross and Ruiz (1966) in a study of endemic plants in the Florida Keys only found plants on Big Pine Key". However, it was found on Cudjoe Key in 2005 (see following section).

Current Range/Distribution: Big Pine partridge pea is widespread only on Big Pine Key, where Ross and Ruiz (1996) found it in 130 of 145 (89 percent) of their pine rockland sample plots. The total number of individuals was estimated to be close to 10,000. Most known plants occur

on National Key Deer Refuge, with approximately 1,000 or fewer plants occurring on unprotected, privately-owned lands elsewhere on Big Pine Key (Bradley and Gann 1999). It is also present on the 21-acre Terrestris Preserve owned by TNC (Gann et al. 2002). On Big Pine Key, pine rocklands encompass approximately 582 hectares (ha) (1,438 acres), according to calculations derived from the Advanced Identification of Wetlands in the Florida Keys (MacAulay et al. 1994) project data.

During the summer of 2005, Hodges and Bradley (2005) discovered a population along a county road on Lower Sugarloaf Key. The population has not yet been enumerated. Related studies are ongoing, and will include systematic sampling for Big Pine partridge pea throughout publicly owned pine rocklands across Big Pine Key. The survey area includes Monroe County and State owned parcels. This will provide the first comprehensive survey of distribution and abundance for the area.

Big Pine partridge pea is also reported from Miami-Dade County (Wunderlin and Hansen 2003, 2004), based on at least one herbarium specimen, but there are no reports of this plant from natural areas in Miami-Dade (Gann et al. 2002), and The Institute for Regional Conservation (2004) considers this report to be in error.

Population Estimates/Status: Ross and Ruiz (1996) estimated that Big Pine Key had close to 10,000 individuals. Muir and Liu (2003) concur with this figure for adult (reproducing) individuals, but note that the entire population is significantly larger when seedlings are considered. Most known plants occur on the National Key Deer Refuge, with approximately 1,000 or fewer plants occurring on unprotected, privately-owned lands elsewhere on Big Pine Key (Bradley and Gann 1999).

Liu (2003) found that Big Pine partridge pea populations recover faster after winter or early summer (May to June) burns than after late-summer, wet season (July to September) burns. Reproduction (seed production) of Big Pine partridge pea was greater after more intense fires, but fire intensity does not appear to affect survival, growth, or seedling establishment. Liu (2003) suggested that a fire frequency of seven years would create the lowest extinction probability for Big Pine partridge pea, and that a fire regime with a wide range of burning seasons may be essential for this and other endemic species of Big Pine Key. Populations decline in areas that have not burned for more than 10 years. Muir and Liu (2003) reported that populations are initially reduced by fire, but they increase rapidly during the five to seven years following fire.

Liu's 2003 dissertation on this plant provides an opportunity to evaluate vegetation management in National Key Deer Refuge as it relates to conservation of the Big Pine partridge pea. A population viability analysis, a paper showing that dry-season fires favor this species, and a paper on the effects of fire intensity on this species have been submitted for publication (Liu et al. submitted). When they are published, Liu's papers, combined with other information, may show that this plant's listing priority can be changed, or that it might be sufficiently secure to be removed from candidate status.

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range. The acreage of pine rocklands on Big Pine Key was reduced from 1,049 ha (2,592 ac) in 1955 to 701 ha (1,732 ac) in 1989 (Folk 1991). This represents a loss of approximately one third of the habitat of the Big Pine partridge pea. Monroe County, which consists of the Keys and mostly-uninhabited mainland, is expected to experience moderate population growth. The county's past and projected population is: 1990--78,024; 2000--79,589; 2010--82,769; 2020--84,765 (Florida Legislature 2004). Average annual population growth for Monroe County, 2000-2004 is 0.62 percent per year and the trend is 1 percent per year or less (Florida Trend 2004). Land acquisition for National Key Deer Refuge and other conservation lands on Big Pine Key is ongoing, although some pine rockland habitat remains subject to development on Big Pine Key. A habitat conservation plan for the endangered Key deer on Big Pine and No Name Keys is under development. When finalized, it will also benefit the endemic plants of Big Pine Key, including Big Pine partridge pea. The estimate by Ross and Ruiz (1996) that about 90 percent of the plants are on the Refuge is probably still roughly correct. Accordingly, unknown but significant portions of the population and range are managed as conservation purposes. There and elsewhere within the range, fire suppression and invasive exotic plants still pose threats to the species habitat. Habitat degradation due to lack of fire and invasive exotic plants in the pinelands is being addressed by both TNC and National Key Deer Refuge, as discussed below under factor "E".

B. Overutilization for commercial, recreational, scientific, or educational purposes. None known.

C. Disease or predation. Liu and Koptur (2003) found that Big Pine partridge pea seed production was lower (fewer seeds per fruit) along urban edges compared to more pristine areas within National Key Deer Refuge. This was attributed to greater seed predation by insects along the urban interface.

D. The inadequacy of existing regulatory mechanisms. The Florida Department of Agriculture and Consumer Services designated *Cassia keyensis* (= *Chamaecrista lineata* var. *keyensis*) as endangered under Chapter 5B-40, Florida Administrative Code. This listing regulates take without permission of the landowner. It provides little or no habitat protection beyond the State's Development of Regional Impact process, which discloses impacts from projects, but does not provide regulatory protection for plants on private lands. A Habitat Conservation Plan for the endangered Key deer (*Odocoileus virginianus clavium*) that is under development by the Service may provide habitat protection for this species.

E. Other natural or manmade factors affecting its continued existence. Fire suppression and exotic plant invasions are the primary threats to *Chamaecrista lineata* var. *keyensis*. Fire is required to maintain the pine rockland community. With fire suppression, hardwoods eventually invade pine rocklands and shade out understory species like *Chamaecrista lineata* var. *keyensis*. Fire suppression reduced the size of the areas that do burn and habitat fragmentation prevents fire from moving across the landscape. Accordingly, in the absence of fire, pine rockland communities tend toward becoming tropical hardwood hammock communities. The National Key Deer Refuge is addressing these problems. For example, in 2003, the Refuge burned a 120-acre site on Big Pine Key that had been unburned for 17 years; this was the largest Refuge burn in recent years. For 10 years, TNC's Terrestris Preserve has been conducting relatively frequent, growing-season prescribed fire, experimental mechanical pre-fire fuel treatments, and ongoing monitoring to quantify the effects of these efforts on community structure and rare plants (U.S. Geological Survey 2004). The Service is working cooperatively with Florida International University in Miami to determine the proper fire frequencies necessary to maintain the pine rockland community on the Refuge; results are not yet available. Fire management at the Refuge is designed to benefit the Key deer and the threatened Garber's spurge (*Chamaesyce garberi*), in pine rockland areas and in patches that are succeeding to hardwood overstories. Additionally, *Chamaecrista lineata* var. *keyensis* is expected to benefit from the implementation of the fire management plan. Possibly the most relevant fire management issue with respect to Big Pine partridge pea is whether the Refuge can conduct some fires in the dry (winter month) or early rainy seasons, a procedure that Hong Liu suggests would benefit this species. It is possible that other considerations may prevent adoption of such a fire regime. Liu (2003) indicated that fire frequency intervals of seven years are optimal, frequencies of less than seven years may be detrimental and frequencies of 10 or more years will result in population decline.

Exotic plants have significantly affected pine rocklands. At least 277 taxa of exotic plants are now known to invade pine rocklands in south Florida (U.S. Fish and Wildlife Service 1998). Some of these may compete directly with *Chamaecrista lineata* var. *keyensis* for space and resources, while others have a profound effect on community structure and responses to fire. The exotic Brazilian pepper (*Schinus terebinthifolius*) is the most widespread and one of the most invasive species. If left uncontrolled in a fire-suppressed pineland, it will form a dense monospecific canopy almost completely eliminating native vegetation. Earleaf acacia (*Acacia auriculiformis*), natal grass (*Rhynchelytrum repens*), shrub verbena (*Lantana camara*), and woman's tongue tree (*Albizia lebbeck*) are some of the other exotic pests in pine rocklands. All of these species affect the characteristics of a fire when it does occur. Fires that once burned fairly coolly with mostly pine needle duff for fuel may now burn much hotter and affect the vegetation that develops following fire. For instance, under some post-fire circumstances, dense bracken fern (*Pteridium aquilinum*) thickets develop (Ross and Ruiz 1996). Therefore, in the presence of exotic species, additional factors must be accounted for in order to manage fire for the benefit of *Chamaecrista lineata* var. *keyensis*. Brazilian pepper is largely under control on Refuge lands and TNC's Terrestris

Preserve.

There has been a 15 centimeter rise in sea level over a 70 year period in the vicinity of Big Pine Key (Ross et al. 1994). The pine rockland community in the Keys has undergone a reduction due to sea-level rise (Ross et al. 1994). For example, the pine rockland area on Sugarloaf Key covered 88 ha prior to 1935, and was reduced to 46 ha by 1935 and 30 ha by 1991. The loss of pine rockland communities was correlated with elevated ground- and soil water salinity, and loss of upland plant diversity was inferred. In areas affected by sea level rise, communities of halophytic plants replaced pine rockland communities (Ross et al. 1994).

Catastrophic events in the form of hurricanes and tropical storms are an additional threat. Hurricanes can permanently change the physiognomy of the landscape and inundate otherwise unaltered landscapes with saltwater for varying durations. Hurricanes may also result in direct damage to plants and plant communities through tearing, crushing and abrasion effects. The small area, small population size, and somewhat patchy distribution of *Chamaecrista lineata* var. *keyensis* renders it susceptible to extinction through such stochastic events. Further reduction of population size would likely enhance threats associated with genetics and demographic stochasticity (Templeton et al. 1990, Fischer and Matthies 1998).

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

A Habitat Conservation Plan for the Key deer, currently in preparation, would also cover Big Pine partridge pea. Fairchild Tropical Garden developed a "Conservation Action Plan" for this taxa (Muir and Liu 2003). Studies conducted by Hong Liu include additional aspects of *Chamaecrista lineata* var. *keyensis* ecology including microhabitat requirements and the effects of Key deer and insect herbivory on population dynamics. We anticipate the publication of this work in peer reviewed journals (Muir and Liu 2003).

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate)

For species that are being removed from candidate status:

___Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	**6***
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Because we do not have new monitoring information, and relevant recent research is pending publication, we are maintaining the previous assessment that a very narrow distribution, combined with fire management and exotic pest plant threats, make for an overall high degree of threat. Due to reporting and publication events pending in 2005, we expect to obtain some additional information on how fire management in National Key Deer Refuge effects the conservation of Big Pine partridge pea. Big Pine partridge pea primarily exists as a single population on Big Pine Key, which over the long run will be protected only on the Refuge, the Terrestris Preserve, and any other small areas of conservation land. However, a satellite population was discovered on Lower Sugarloaf Key in 2005. The estimate by Ross and Ruiz (1996) that about 90 percent of the plants are on the Refuge is probably still roughly correct. Recent prescribed burns on long-unburned areas of the Refuge offer an opportunity to observe whether this species benefits, and whether effects of lack of fire can be reversed. For about 90 percent of the species' range, therefore, threat in the form of human development and other causes is largely absent. The level of threat from fire exclusion depends upon the fire management regime applied on the Refuge. There is a strong likelihood that in areas managed with fire, the partridge pea can persist. Affected populations can be salvaged where fire management is applied, unless confounded by a profound takeover by non-indigenous flora. This potential currently appears unlikely due to active control on the Refuge. For the remaining 10 percent of the population, some level of threat from human development and related factors remains.

Imminence: Land acquisition for the National Key Deer Refuge is largely completed, so questions of imminence of threats are primarily questions of the adequacy and effectiveness of prescribed fire in the pinelands. Fire management is being accomplished. The existing literature indicates that fire return intervals are relatively long in the lower Keys. Due to low precipitation, the vegetation does not grown as rapidly as it does on the mainland. This provides Refuge managers with greater leeway than would be the case in some mainland pinelands. Invasive exotic pest plants have not been allowed to overrun the Refuge. The best available information indicates that while this plant is intrinsically vulnerable to extinction because it is a narrow endemic, existing Refuge management is unlikely to need to be altered abruptly or radically to maintain the species. There has been a 15 centimeter rise in sea level over a 70 year period in the vicinity of Big Pine Key (Ross et al. 1994). For Big Pine Key, specific data on the response of pine rockland community to sea-level rise is not available.

Rationale for Change in Listing Priority Number (insert if appropriate): N/A

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. We think it may be feasible, when Hong Liu's papers are published, and when a population survey can be completed, to remove this species from candidate status. A population survey is currently funded and under way.

DESCRIPTION OF MONITORING: The Service has conducted extensive literature searches and obtained all recent and most historical documents pertaining to Big Pine partridge pea. The majority of known populations of Big Pine partridge pea occur on Big Pine Key, and most of those are within National Key Deer Refuge. Ross and Ruiz (1996) found Big Pine partridge pea to be well distributed on the Refuge, where they found it among 130 of 145 (89 percent) of their pine rockland sample plots. The partridge pea is not regularly monitored on National Key Deer Refuge. Accordingly, the current status of the partridge pea is unknown on the Refuge. To fill this gap, the Service funded a project (Hodges and Bradley 2005) to comprehensively assess Big Pine partridge pea abundance on the Refuge and other conservation lands in pine rockland cover throughout Big Pine Key. Once completed, findings will be compared to those of Ross and Ruiz (1996) so that the quantitative changes in abundance and qualitative changes in distribution can be assessed. The Refuge has an active prescribed fire program that should benefit the partridge pea.

Although most known plants occur on National Key Deer Refuge, approximately 1,000 or fewer plants occur on unprotected, privately-owned lands elsewhere on Big Pine Key (Bradley and Gann 1999). During the summer of 2005, Hodges and Bradley (2005) discovered a population along a county road on Lower Sugarloaf Key. The species is also present on the 21-acre Terrestris Preserve owned by TNC (Gann et al. 2002). TNC conducts burns every several years on 3 units across this preserve, and also applied mechanical thinning to one of the units. Monitoring was conducted annually from 1993-2002 (Slapcinsky and Gordon 2003). Mean density of partridge pea (number/$2m^2$ plot) increased from 5.8 to 51.2 in unit 1 (1993-2002), 18.8

to 337.6 in unit 2 (1994-2002) and 6.5 to 7.5 in unit 3 (1993-2002). These figures reflect the plants characteristically favorable response to a range of prescribed fire regimes.

The Service is collaborating with TNC to assemble, reconstruct, and render on GIS all known wildland fire histories for the Lower Keys, including the prescribed fires on and adjacent to National Key Deer Refuge in recent years. We will attempt to ensure that the fire history distribution is appropriately incorporated into the sampling scheme of future inventories and monitoring efforts, so that inferences may be drawn as to the effects of varied fire regimes. Recent demographic research by Hong Liu (Florida International University), which will likely be published in 2005, will help, particularly in conjunction with additional monitoring data, to refine knowledge about the management needs of this species.

The Service is not proposing a change in status for this species at this time.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: none.

Indicate which State(s) did not provide any information or comments: Florida

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Jeffrey M. Fleming 11/16/2005
Acting Regional Director, Fish and Wildlife Service Date

Concur: _____ August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do Not Concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: October 2005

Conducted by: South Florida (Vero Beach) Field Office